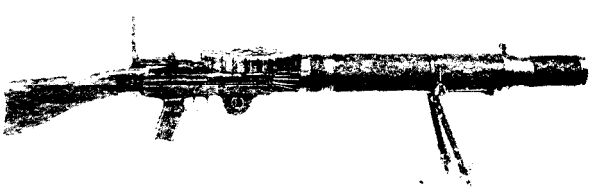
LEWIS
MACHINE GUN
HAND-BOOK



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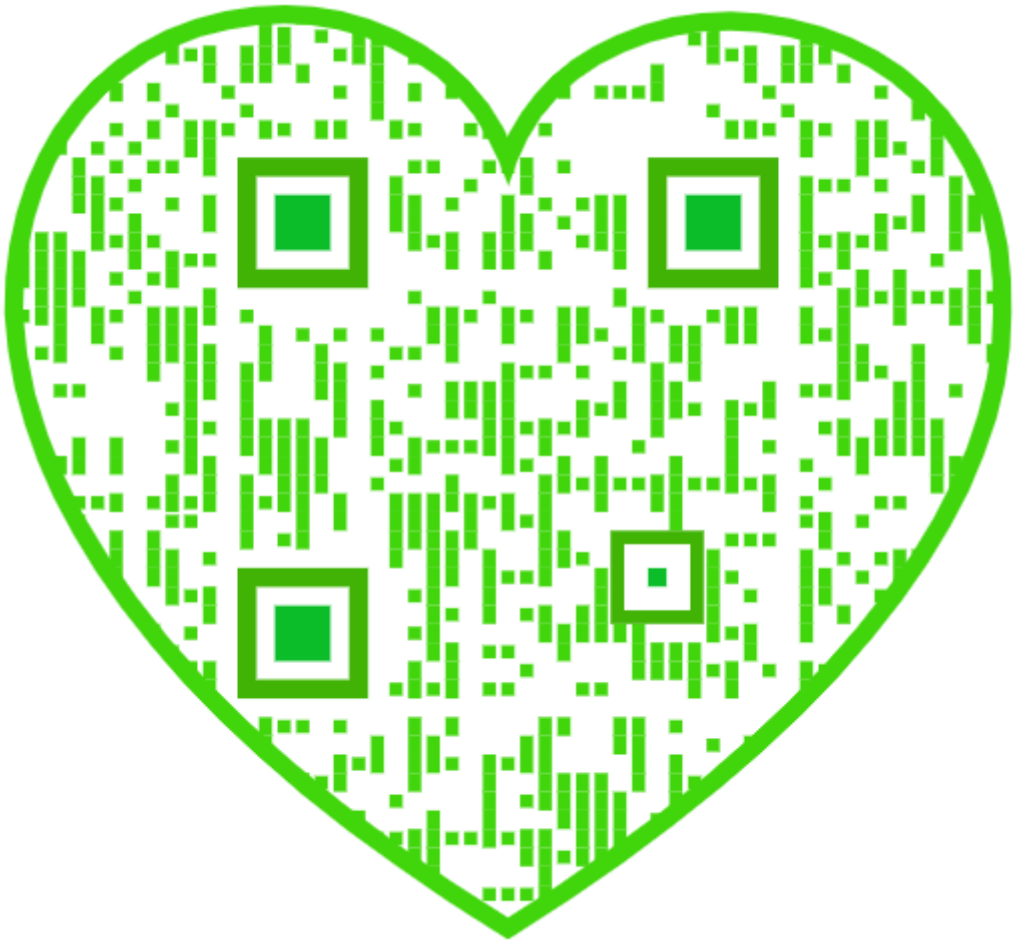

HAND-BOOK

of the

LEWIS MACHINE GUN

MODEL 1918
CALIBER .30

SAVAGE ARMS CORPORATION
UTICA, NEW YORK, U. S. A.

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GENERAL DESCRIPTION

MODERN machine guns are classified by feeding means, operating means and cooling means. The Lewis Machine Gun is magazine-fed, gas-operated and air-cooled.

The magazine is a circular drum in which the cartridges are arranged radially, bullet ends toward the center. The magazine center has a deep spiral groove in which the bullet ends of the cartridges engage and by which they are controlled. The other parts of the magazine are rotated around the center during the operation of the gun, thus driving the spirally arranged column of cartridges down the helical groove of the magazine center until they are successively reached by the feed operating arm.

Motive power for the operation of the mechanism is obtained from gas pressure produced in the barrel by the exploding cartridge. This gas is taken through a hole near the muzzle of the barrel into a cylinder under the barrel, in which it drives a piston rearward. This directly produces the opening stroke of the action and, by winding the mainspring, stores the motive power to be used in the closing stroke.

Air is used as a cooling agent (a) by surrounding the barrel with a radiator having high longitudinal radial fins and so presenting to it the largest possible surface for radiation, (b) by using as radiator material aluminum, a metal of high thermal conductivity, and (c) by mechanically sucking columns of air along these radiating surfaces by using the muzzle blast of firing as a suction pump.

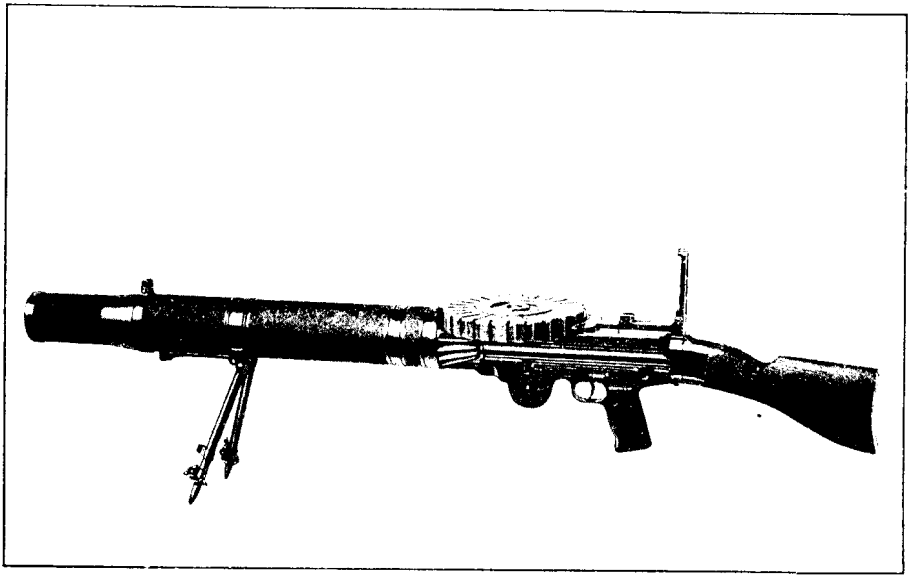

PLATE I—GUN COMPLETE WITH MAGAZINE AND BIPOD FIELD MOUNT

WEIGHTS *and* MEASUREMENTS

The weights and measurements of the Lewis Machine Gun are as follows:

Weight of gun	26 lbs. 8 oz.
Weight of gun with bipod mount	28 lbs. 4 oz.
Weight of magazine (empty)	1 lb. 8 oz.
Weight of magazine (filled)	4 lb. 8 oz.
Weight of bipod mount	1 lb. 12 oz.
Length of gun with rifle butt	51″
Length of gun with spade grip	44″
Length of barrel	26⅝″
Distance between sights	32.177″
Sights graduated up to 2100 yds.	
Trigger pull	12 to 14 lbs.
Diameter of bore	0.30″
Rifling, number of grooves	4
Twist uniform—one turn in ten inches	
Weight—Bullet	150 gr.
Weight—Powder	48 to 50 gr.
Weight—Cartridge	About 395 gr.
Muzzle velocity	2700 ft. per second
Chamber pressure	48,000 to 49,000 lbs. to sq. in.

In the Lewis Machine Gun cartridges are under mechanical control at all times and feed is absolutely positive. The gun will function perfectly at any angle of elevation or depression and when turned on either side or upside down.

In this hand-book, instructions as to manual operation and description of the corresponding mechanical functioning of the gun are so combined as to associate the effect with

the cause, and to lead in the most direct way to actual familiarity with the gun.

To handle a machine gun properly, the operator must know it as he knows himself. He must know its parts, their functions, relations and adjustment, their characteristics and their tendencies so well that it is not necessary to stop to think about them.

He must be able to dismount and assemble the gun as naturally and easily as he would handle his rifle.

The slightest unusual symptom when the gun is firing must tell the operator at once not only what is the matter, but how to fix it. And he must fix it at once as naturally and subconsciously as he would extract a fired shell from his rifle. Recognition should be immediate and instinctive—correction, immediate and reflexive.

DISMOUNTING *and* STRIPPING

To dismount the gun, a cartridge and the barrel mouthpiece spanner (which has a screwdriver end) are sufficient. For detailed stripping, drifts are required.

BUTT STOCK

To Remove. Press and hold in butt latch with point of bullet, give butt stock one-eighth turn to left and withdraw.

To Strip. (It is not advisable to strip butt stock.) Turn out butt tang screw, releasing butt tang from butt stock. Turn out both butt plate screws and remove butt plate.

After removing butt stock hold back trigger, pull back guard far enough to permit rear end of gear casing to swing down until it hangs at such an angle that the receiver locking pin moves freely. Then slide guard forward gently against gear so as to use guard as handle for receiver in further dismounting.

FEED COVER

To Remove. Press both thumbs against rear end of receiver and pull feed cover rearward with fingers until its lugs clear their retaining surfaces on the receiver. Then lift feed cover off.

To Strip. Press the stud on the stop and rebound pawls spring out of its seating in the transverse rib by pressing with the point of a bullet introduced through the channel and hole from the opposite side of the rib. When spring is removed lift stop pawl and rebound pawl off their studs. Press stud of cartridge guide down and slide it out of its seating.

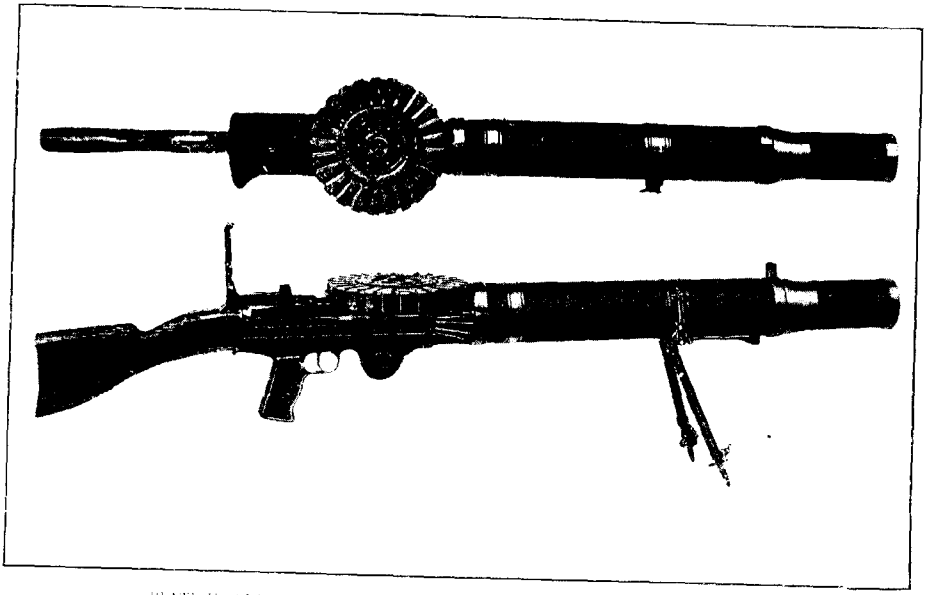

PLATE II—.62 N COMPLETE WITH MOUNT—TOP VIEW AND RIGHT SIDE VIEW

FEED OPERATING ARM

To Remove. Swing feed operating arm around magazine post so that retaining lug on magazine post is in line with its cut in hole in feed operating arm. Then lift feed operating arm off magazine post.

To Strip. Lift feed pawl spring and feed pawl off their posts, using point of bullet.

CHARGING HANDLE

To Remove. Draw back until rear end of rack reaches rear of receiver and pull charging handle out to side.

PISTON AND RACK AND BOLT

To Remove. After rear end of gear casing is released and charging handle is removed as above, draw the rack (carrying bolt on striker post) and piston back entirely out of receiver. Lift bolt off striker post.

To Strip Piston and Rack. To remove striker, drive out striker fixing pin. It is not advisable to separate piston from rack. To do so, drive out piston connecting pin, unscrew piston from rack.

To Strip Bolt. Unscrew and remove feed operating stud. To remove either extractor, lift hook of extractor with point of bullet until stud on shank of extractor is clear of its recess in bolt. Then pull extractor forward out of its slot.

RECEIVER

To Remove. Push receiver locking pin to the rear with point of bullet until it clears its hole in the radiator casing rear locking piece. Turn receiver off barrel (right-handed thread), using guard as handle.

GEAR CASING

To Remove. Push receiver locking pin forward out of receiver and unhook gear casing from the gear case hinge pin.

To Strip. Press up gear stop with point of bullet and allow mainspring to unwind. Unscrew collet pin and shake out gear. Press through the gear against the mainspring collet with point of bullet so as to force out mainspring casing. The mainspring and the mainspring collet may be removed from the mainspring casing with the point of a bullet.

GUARD

To Remove. Hold back trigger and pull guard off to the rear.

To Strip. Punch out trigger pin and sear pin. Pull back trigger and lift out trigger and sear.

EJECTOR

Pry up rear end of ejector cover with point of bullet and draw out. Insert point of bullet in hole in receiver for ejector hub, so as to raise rear end of ejector out of recess, and lift out with fingers.

GAS REGULATOR CUP

Lift end of gas regulator key with point of bullet until stud is clear of its hole in the radiator casing. Unscrew and remove gas regulator cup.

BARREL GROUP

It is not advisable to dismount or strip the barrel group except when necessary. Barrel should not be taken out of radiator except for replacement.

CLAMP RING

Unscrew the clamp ring screw with screwdriver on barrel mouthpiece spanner and remove the clamp ring which carries the front sight and clamp ring positioning screw.

RADIATOR CASING FRONT

Pull radiator casing front off forward.

RADIATOR CASING REAR

Remove radiator casing rear, which is permanently assembled to the radiator casing rear locking piece, off to the rear.

GAS CYLINDER

Unscrew and remove the gas cylinder, using the piston and rack as a wrench (the cross section of the rack permits this)

GAS CHAMBER GLAND

Turn out of gas chamber with barrel mouthpiece spanner (thread is left-handed).

BARREL MOUTHPIECE

Unscrew barrel mouthpiece with barrel mouthpiece spanner (thread is left-handed).

BARREL

Keep barrel mouthpiece on about three threads and drive barrel back enough to free it in radiator by striking barrel mouthpiece.

GAS CHAMBER

When the barrel comes out of the radiator the gas chamber is left lying in its recess in the radiator.

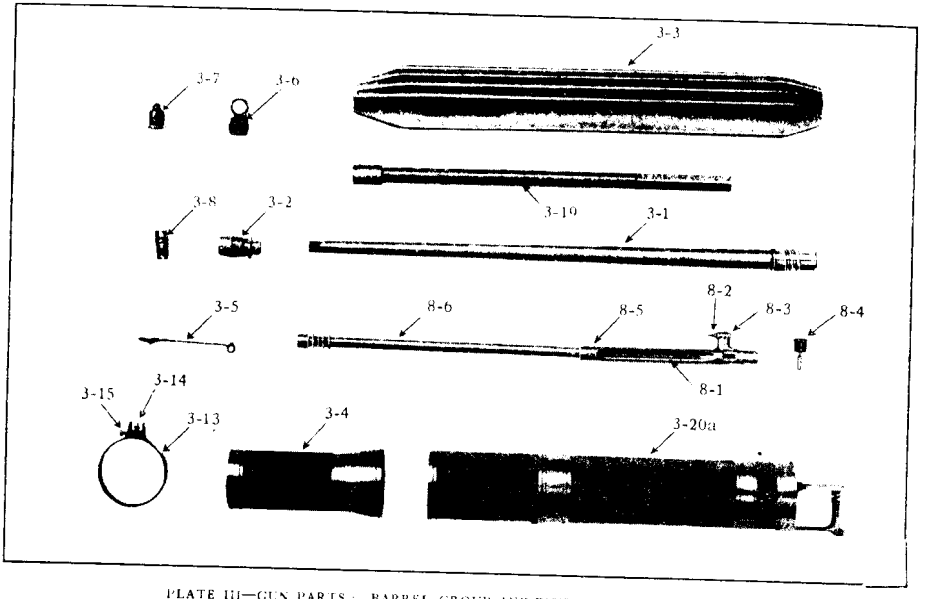

PLATE III—GUN PARTS: BARREL GROUP AND PISTON AND RACK GROUP

PLATE III

BARREL GROUP (3) AND RACK AND PISTON GROUP (8)

3-1	Barrel
3-2	Barrel Mouthpiece
3-3	Radiator
3-4	Radiator Casing, Front
3-20A	Radiator Casing, Rear (assembled)
3-5	Gas Regulator Key
3-6	Gas Chamber
3-7	Gas Chamber Gland
3-8	Gas Regulator Cup
3-13	Clamp Ring
3-14	Front Sight
3-15	Clamp Ring Screw
3-19	Gas Cylinder
8-1	Rack
8-2	Striker
8-3	Striker Fixing Pin
8-4	Charging Handle
8-5	Piston Connecting Pin
8-6	Piston

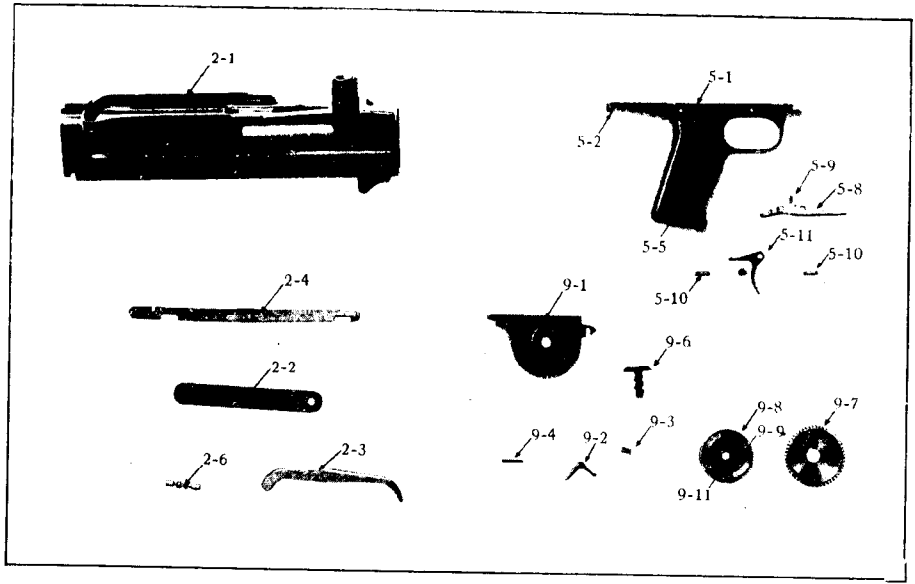

PLATE IV - GUN PARTS : RECEIVER GROUP, MAINSPRING AND TRIGGER MECHANISM

PLATE IV

RECEIVER GROUP (2) MAINSPRING GROUP (9) GUARD GROUP (5)

2-1 Receiver
2-2 Ejector Cover
2-3 Ejector
2-4 Safety
2-6 Receiver Locking Pin

9-1 Gear Casing
9-2 Gear Stop
9-3 Gear Stop Spring
9-4 Gear Stop Pin
9-6 Mainspring Collet Pin
9-7 Gear
9-8 Mainspring Casing
9-9 Mainspring
9-11 Mainspring Collet

5-1 Guard
5-2 Butt Latch
5-3 Butt Latch Spring
5-4 Butt Latch Pin
5-5 Guard Side Piece (right)
5-6 Guard Side Piece (left)
5-8 Sear
5-9 Sear Spring
5-10 Sear Pin (used also for Trigger Pin)
5-11 Trigger

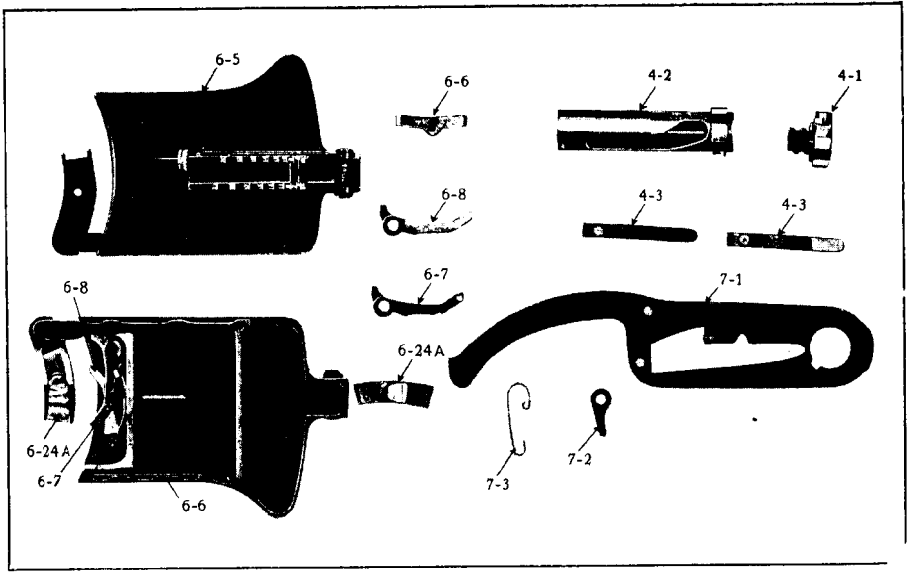

PLATE V—GUN PARTS : FEED MECHANISM, BOLT AND EXTRACTORS

PLATE IV

RECEIVER GROUP (2) MAINSPRING GROUP (9) GUARD GROUP (5)

2-1 Receiver
2-2 Ejector Cover
2-3 Ejector
2-4 Safety
2-6 Receiver Locking Pin

9-1 Gear Casing
9-2 Gear Stop
9-3 Gear Stop Spring
9-4 Gear Stop Pin
9-6 Mainspring Collet Pin
9-7 Gear
9-8 Mainspring Casing
9-9 Mainspring
9-11 Mainspring Collet

5-1 Guard
5-2 Butt Latch
5-3 Butt Latch Spring
5-4 Butt Latch Pin
5-5 Guard Side Piece (right)
5-6 Guard Side Piece (left)
5-8 Sear
5-9 Sear Spring
5-10 Sear Pin (used also for Trigger Pin)
5-11 Trigger

PLATE V

FEED MECHANISM GROUP (6 AND 7) BOLT (4)

6-1 Back Sight Axis Pin
6-2 Back Sight Axis Pin Washer
6-3 Back Sight Axis Pin Split Keeper
6-4 Back Sight Bed Spring
6-5 Feed Cover
6-6 Stop and Rebound Pawl Spring
6-7 Stop Pawl
6-8 Rebound Pawl
6-9 Back Sight Leaf
6-10 Back Sight Elevating Screw
6-11 Back Sight Slide
6-12 Back Sight Elevating Screw Head Spring
6-13 Back Sight Elevating Screw Head
6-14 Back Sight Elevating Screw Head Pin
6-24A Cartridge Guide (assembled)

7-1 Feed Operating Arm
7-2 Feed Pawl
7-3 Feed Pawl Spring

4-1 Feed Operating Stud
4-2 Bolt
4-3 Extractor

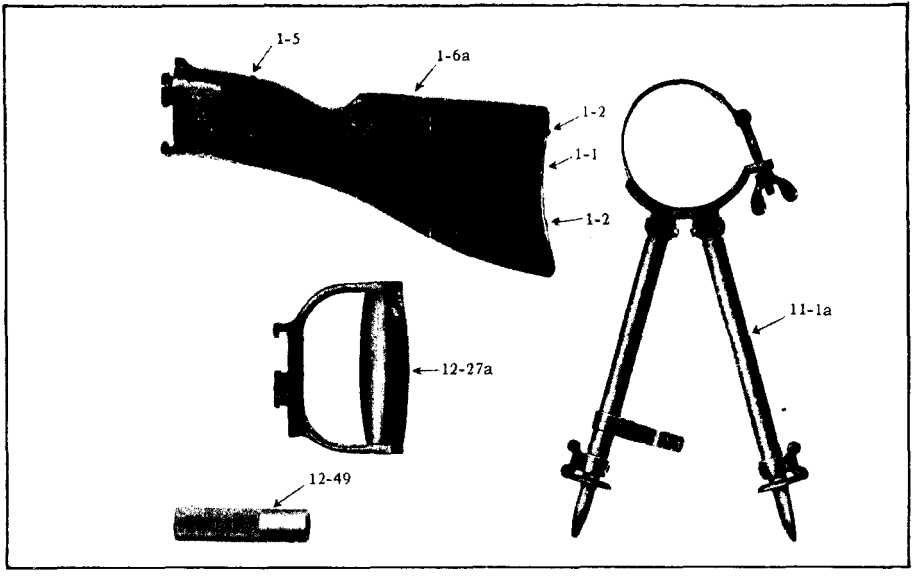

PLATE VI—BUTT STOCK, LOADING HANDLE, SPADE GRIP AND BIPOD MOUNT

PLATE VI

BUTT STOCK (1), SPADE GRIP AND MAGAZINE FILLING HANDLE (12) AND BIPOD MOUNT (11)

1-6A Butt Stock (assembled)
1-1 Butt Plate
1-2 Butt Plate Screw
1-5 Butt Tang Screw

12-27A Spade Grip (assembled)
12-49 Magazine Filling Handle

11-1A Bipod Mount (assembled)

ASSEMBLING

The gun is assembled by reversing the operations just given for dismounting. When completely dismounted it is advisable to assemble in the following order:

1. Barrel group:
    a. Gas chamber in radiator.
    b. Barrel into radiator and gas chamber.
    c. Gas chamber gland.
    d. Gas cylinder.
    e. Barrel mouthpiece.
    f. Radiator casing, rear.
    g. Radiator casing, front.
    h. Clamp ring.
    i. Gas regulator cup.
    j. Gas regulator key.
2. Ejector.
3. Ejector cover.
4. Gear, gear casing and receiver locking pin.
5. Guard (merely slipping it on receiver and up against gear to act as handle).
6. Receiver and barrel (screw barrel onto receiver).
7. Feed operating arm (pressed fully over to left).
8. Piston and rack with bolt on striker post.
9. Charging handle (replace charging handle, push it forward fully).
10. Feed cover.
11. Lock gear by raising gear case and pushing guard forward to engage it.
12. Replace butt stock.

Care should be taken:

(1) To avoid damaging the projections on the rear face of the barrel in replacing barrel and radiator in radiator casing rear locking piece.

(2) To avoid damaging the threads of the threaded parts, especially the gas chamber gland, gas cylinder and barrel mouthpiece, or allowing sand, dust or grit to get into threads.

(3) To see that the gas chamber is correctly inserted in its recess in the radiator before the barrel is pushed home, so that the barrel loop of the gas chamber will encircle the barrel. (The barrel loop is tapered, and its smallest diameter must be toward the front end of the radiator.) Also that the barrel is turned so that the gas port is at the bottom and over the center of the gas chamber.

(4) In replacing feed cover, that the feed operating arm is over to the right.

(5) That the feed operating stud is screwed into the bolt as far as it will go and that the cam slot in the bolt is slipped over the striker before putting piston and bolt in gun.

(6) That when replacing bolt the feed operating arm is over to the left so that the feed operating stud will engage its groove.

(7) That after inserting bolt, piston and charging handle, the charging handle is brought to the extreme forward end of its stroke before the gear casing is swung up into place and the gear engaged with the rack.

(8) That the tension of the mainspring is correct—from twelve to fourteen pounds. If the tension is too low the rack will strike the butt tang too hard in opening and

the action may fail to close or the gun may misfire. If it is too high the gun will fire too fast; if much too high the gun will not open far enough to feed the next cartridge.

TO ALTER MAINSPRING TENSION

Remove butt stock and draw guard back enough to disengage gear casing.

To increase tension hold up gear casing so as to keep gear engaged with rack and draw back charging handle. Draw down gear casing so that gear does not engage rack and push charging handle fully forward. Raise gear casing again, slide guard forward to engage it, and replace butt stock.

To decrease tension hold gear casing down so that gear is not engaged with rack and draw back charging handle. Then raise gear casing, engage gear with rack and slide guard forward to engage gear casing, which will cause the charging handle to snap forward and the action to close.

The average working tension of the mainspring is from twelve to fourteen pounds. To weigh it, engage hook of spring balance (supplied with gun) with charging handle; hold back trigger; draw back charging handle by means of spring balance so that it is just started to the rear. Hold spring balance so as to keep charging handle at this point, and record reading.

When the gun is not about to be fired the mainspring should not be in tension.

OPERATION

TO FILL MAGAZINE WITH LOADING HANDLE

Turn magazine upside down.

Insert loading handle in socket in magazine center. This holds magazine latch out of engagement and permits rotating magazine center independently of the rest of the magazine.

Spin magazine on loading handle to see that it is not distorted.

Rotate the magazine center and at the same time place cartridges successively between the separator pins so that their bullet ends will pass into the spiral groove in the magazine center. Do not leave an empty space between cartridges, as in firing this would cause a stoppage. The magazine holds forty-seven cartridges, and when it is filled remove loading handle and turn magazine center back until it snaps. This locks magazine.

TO FILL MAGAZINE WITH LOADING TOOL

Attach loading tool to table or other base.

Turn magazine upside down.

Slip hole in magazine center up over magazine post under loading tool until magazine latch engages post.

Spin magazine to see that it rotates freely.

Place a clip full of cartridges in top of chute and insert clip in clip ejector (at right), bullet ends to left (toward magazine center).

Press cartridges down, stripping them out of clips into chute.

Put on pressure close to clip and do not depress points.

Repeat often enough to keep chute full of cartridges.

Rotate magazine from left to right (clockwise).

Cartridges will feed into magazine.

If a space in magazine is skipped, rotate magazine backward past vacant space and then rotate forward again.

When magazine is filled, unlatch and remove from post.

Turn back magazine center until it snaps. This locks magazine.

TO LOAD GUN

See that the charging handle is fully forward.

Place a magazine on the magazine post, the thumb piece of the magazine latch to the right, and press the magazine down.

Rotate it very slightly in both directions, until the magazine latch engages on magazine post.

Draw back the charging handle fully so that it is engaged and held back. This draws back the piston and rack and performs by hand what the gas pressure of firing does. Drawing the rack teeth back over the gear teeth with which they are meshed rotates the gear and winds the mainspring during the entire opening movement. During the first $1\frac{1}{8}$ inches of rearward travel the striker post moves back through the longitudinal part of its cut in the bolt and merely draws back the point of the striker from the face of the bolt. The bolt itself remains in its locked position and does not move.

In the next $\frac{3}{8}$ of an inch of rearward travel, the striker post, driven still further rearward in the bolt, strikes with its right side the cam surface in the right side of its slot in the bolt and causes the bolt to rotate from right to left, turning the locking lugs out of their recesses in the receiver.

As soon as the bolt is unlocked, the striker post reaches

the rear end of its cut in the bolt, and in its further travel carries the bolt directly back with it.

The top lug of the feed operating stud, traveling in the groove in the under side of the feed operating arm, cams the feed operating arm so that it swings across the top of the receiver from right to left.

The feed pawl, acting against one of the outer projections of the magazine pan, carries the magazine around sufficiently to drive the first cartridge down into the cartridge opening in the feed operating arm by the rotation of the magazine pan and separator pins around the stationary spirally grooved center.

At this point in the leftward travel of the feed operating arm, its cartridge opening (and in it the cartridge it has just received) commences to pass under the upward projecting arms of the feed cover which carry the cartridge guide, and those arms commence to control the cartridge as soon as it leaves the magazine.

Further leftward travel of the feed operating arm brings the cartridge under control of the cartridge guide and the downward pressure of its spring tension.

At this point the spring stud on the feed operating arm clears the stop pawl, which is then pressed forward by its spring and prevents further rotation of the magazine.

When the bolt strikes the rear end of the ejector it drives it into its slot, thus pivoting the ejector head out.

Toward the end of the rearward travel of the piston the downward projection of the lower surface of the rack at the rear whose front surface forms the cocking notch rides over the nose of the sear, temporarily depressing it against the tension of the sear spring, which immediately raises it again

The rear end of the rack then strikes the butt tang, terminating the opening stroke.

The feed operating arm is now at the extreme left, the cartridge has been brought over the cartridge opening in the top of the receiver into which the cartridge guide presses it, the rebound pawl presses against an exterior projection of the magazine so as to prevent backward rotation, and the mainspring is fully wound up.

The mainspring now rotates the gear, whose teeth, meshed with those of the rack, drive the rack forward a trifle till the nose of the sear engages with the cocking notch in the lower edge of the rack and suspends the operation.

The gun is now ready to fire

TO FIRE

FULL AUTOMATIC FIRE

Press trigger and hold back. Gun will fire automatically as long as trigger is held back until magazine is empty When trigger is released gun stops firing.

SEMI-AUTOMATIC FIRE

To fire single shots press trigger and release immediately. To release quickly enough for a single shot requires some practice. Bursts of any desired length may be fired by holding back the trigger the required period of time and releasing.

When the trigger is pressed the sear is drawn down out of engagement with the notch in the rack. The rack is driven forward by the pressure of the mainspring, which unwinds, and consequently rotates the gear, whose teeth are meshed with those of the rack. The striker post is at the rear end of the cam slot in its cut in the bolt. Its left side is pressing against the left side of the cam slot, but it now simply drives the bolt forward without rotating it because the bolt is prevented from rotation by the cruciform shape of the bolt-way in the receiver at this point.

The feed operating stud, carried forward with the bolt and traveling forward in its cut in the under side of the feed operating arm, cams the feed operating arm to the right.

The feed pawl slips over the projection on the rim of the magazine and engages behind it.

The spring stud on the feed operating arm presses the stop pawl back to prevent its intercepting a magazine projection.

The head of the bolt now reaches the head of the ejector, which it presses back into the ejector cut, causing the rear of the ejector to be pivoted out into the bolt-way behind the bolt.

The face of the bolt now strikes the base of the cartridge which is held ready for it in the loading ramps of the receiver, and it drives the cartridge before it into the chamber.

The extractors spring over the rim as soon as the cartridge seats.

Just as the cartridge seats, the locking lugs of the bolt clear the front of the cruciform part of the bolt-way formed by their guide grooves and reach their locking recesses.

Further forward movement of the bolt is not possible. The bolt face rests against the rear end of the barrel and the head of the cartridge. The pressure of the mainspring which still drives the striker post forward causes the striker post, which is pressing against the left side of the cam slot in the bolt, to cam the bolt around to the right. This turns the locking lugs fully into the locking recess of the receiver.

As the bolt locking is completed the striker post enters the longitudinal front part of its cut, carries the striker against the primer of the cartridge in the chamber, and fires the cartridge.

The firing of the cartridge now develops the power for another cycle of operation.

When the bullet passes the gas port near the muzzle of the barrel, gas under high pressure is driven through the gas port into the gas chamber and through the hole in the gas regulator cup onto the head of the piston.

This drives the piston back and produces the same oper-

ation of parts described above where the opening stroke was made by hand, except for the disposition of the fired shell.

The shell, in the grip of the extractors, is drawn back with the bolt, and is carried on the face of the bolt until the bolt strikes the rear end of the ejector, as previously described. The pivoting of the head of the ejector, which swings sharply against the left side of the extracted shell, throws the shell out of the ejector port.

Whether the gun will fire again or will remain in the "ready to feed" position depends upon whether or not the trigger is still held back.

If the trigger is still held back, and the sear consequently depressed, at the beginning of the closing stroke of the action the gun will continue firing.

If the trigger has been released so that the sear intercepts the cocking notch in the rack, the gun is left "ready to feed."

The cycle of operation may be briefly summarized as follows:

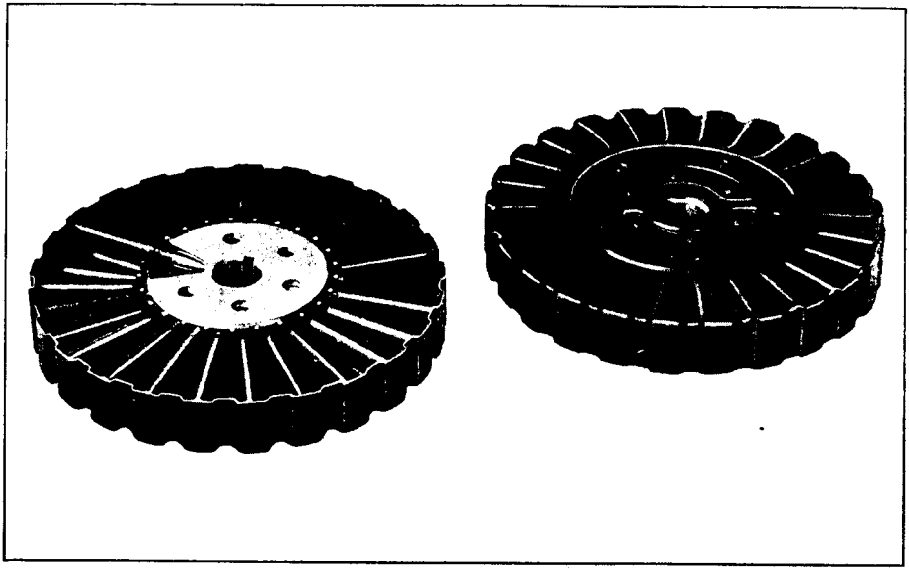

PLATE VII—MAGAZINE—TOP VIEW AND BOTTOM VIEW

PLATE VII

10-1A MAGAZINE (ASSEMBLED)

The magazine holds forty-seven cartridges. Instructions for loading magazine are given on Page 27.

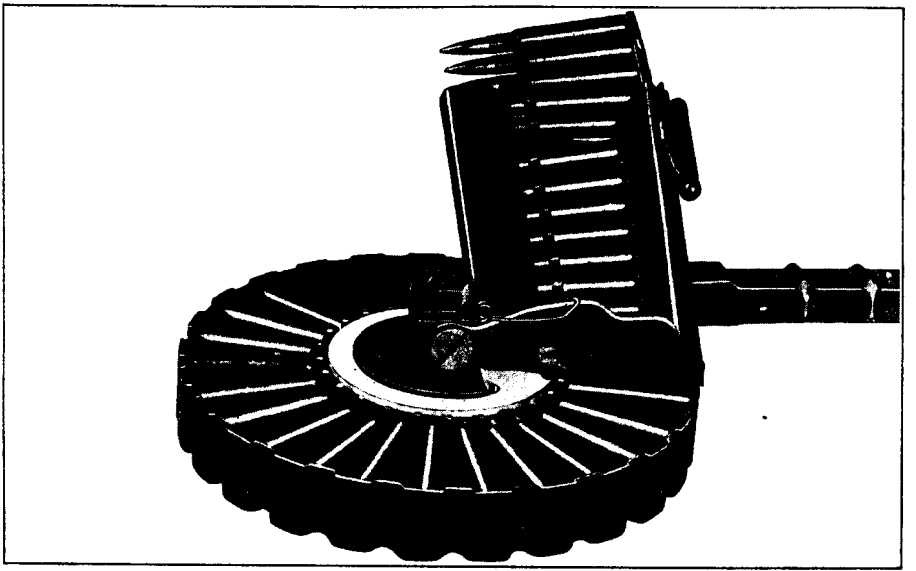

PLATE VIII—LOADING TOOL WITH MAGAZINE IN POSITION

PLATE VIII

12-30A LOADING TOOL
(ASSEMBLED)

Instructions for the use of the loading tool are given on Pages 27 and 28

BACKWARD ACTION

ACTION OF	OPERATES
Gas	Piston and rack.
Piston and rack	Mainspring and stopped by butt tang.
Striker post	Unlocks bolt and carries it to the rear.
Bolt	Extracts empty shell, operates feed operating arm, ejector, stopped by butt tang.
Feed operating arm	Rotates magazine, releases (right) stop pawl, carries cartridge.
Magazine	Feeds cartridge onto feed arm and next one into position, forces (left) rebound pawl to rear.

FORWARD ACTION

ACTION OF	OPERATES
Mainspring	Piston and striker post.
Piston, rack and striker post	Bolt locked and round fired.
Bolt	Feed operating arm, cartridge into chamber, ejector.
Feed operating arm	Pawl over and behind projection, (right) stop pawl to the rear.

"SAFETY"

TO PUT THE GUN AT "SAFE"

The gun being "ready to feed," with the charging handle back and sear engaging rack, press up safety until its rear notch encloses the shank of the charging handle. Pull trigger, allowing the charging handle to go forward enough to engage with the under cut at the front of the slot in the safety. In this position the gun is locked at "Safe."

WHEN AT "SAFE" TO PUT GUN IN ACTION

Draw back charging handle to cock. This frees safety.

Press down safety. Gun is again "ready to feed," and will fire if trigger is pressed.

Raising the safety when the charging handle is forward (and the bolt is filling the ejector port) closes the action so as to prevent dust, sand, water, etc., from getting into the receiver.

The gun with charging handle forward, chamber empty, magazine on post and safety raised is practically dust and water proof, and may be carried safely and conveniently and put into action instantly by one man.

To put in action, press down safety and pull back charging handle.

CAUTION. *Never let the charging handle forward by hand so that the bolt rests on a loaded cartridge in the chamber.*

Remember that when magazine is on gun and charging handle is pulled to rear, gun is cocked and ready to fire. Always put it at "Safe."

TO UNLOAD GUN

When cartridge in receiver may be fired, press over magazine latch, remove magazine and pull the trigger. This will fire the cartridge which was in position in the loading ramps in the receiver.

When it is necessary to unload without firing cartridge in receiver, press over magazine latch and remove magazine, hold charging handle with left hand, press trigger with right hand and ease charging handle forward slowly so as to push cartridge from loading ramps into bolt-way in receiver.

Then pull back charging handle fully so that sear engages and raise safety. With point of bullet of another cartridge press down through loading slot in top of receiver against cartridge so that it can be removed through ejector port.

After unloading gun always snap (by drawing back charging handle to cock and pulling trigger), to make certain that gun is empty and that there is no cartridge in the receiver.

CARE *and* ADJUSTMENT

It is necessary to keep continually informed of the condition of each part of the gun. Adjustment by use of file, oil-stone or emery should be made only by an armorer. Examination should include the following points:

Barrel. Inspect the interior of barrel and chamber, the guide lips of the chamber, which project from the rear face of the barrel, and the thread on the muzzle.

Gear, Casing and Mainspring. See that gear teeth, stop and spring are not damaged, that gear case hinge pin is secure and that mainspring is not broken.

Ejector. See that it is not damaged.

Feed Operating Arm. Observe that the feed pawl and feed pawl spring are properly adjusted.

Feed Cover. Notice whether the pawls and spring are damaged and whether the cartridge guide is properly assembled.

Piston. See that the piston connecting pin is not loose, that the teeth and the cocking notch of the rack are not damaged, and that the working surfaces of the striker post are not burred or rough. Note whether the striker is damaged.

Bolt. The edges of the cam slot should be smooth. Any burrs or roughness should be removed by an armorer with oil-stone or fine emery cloth. Test head space with maximum heading gauge. A bolt which closes over the maximum heading gauge must be changed.

Weigh each extractor by engaging hook of spring balance with extractor hook and pulling at right angles to bolt. Read balance when extractor moves. If under three pounds, exchange extractor.

POINTS BEFORE FIRING

See that bore is clear.

Weigh mainspring and correct tension, if necessary (twelve to fourteen pounds).

Verify oiling—if in doubt oil again.

Examine gun cases to see that all tools and spare parts are in place and that they, gun and magazines are properly secured in their containers against loss or damage in transportation.

See that oil can is full.

Final Test: See that charging handle moves freely, that feed operating arm moves when it does. Weigh mainspring. Test ejection with dummy cartridge. Place empty magazine on post. Hold it with right hand and work charging handle to prove that feed mechanism rotates magazine.

POINTS DURING FIRING

Magazines should be kept in container until required. Empty magazines should be replaced in container when removed from gun, but should be refilled without preventable delay. Deformation of the rim of the magazine or the entry of dirt or grit in the bullet groove in the magazine center should be carefully guarded against. A partially emptied magazine should be replaced by a full one when fire ceases temporarily.

During temporary cessation of fire, raise safety. If time permits, unload gun and oil bolt, striker post and piston. Weigh spring and adjust tension if necessary. Do not allow tension to drop under twelve pounds, as it might cause breakage of parts.

If gun misfires, wait a few seconds before drawing back charging handle.

POINTS AFTER FIRING

Unload (and snap).

Relax mainspring tension.

Clean and oil barrel, cylinder, piston and gas chamber gland.

Collect any unfired cartridges among empty shells.

Examine, clean and oil all parts of gun as soon as practicable.

POINTS WHEN MACHINE GUN IS PLACED IN BOX

1. Bore oily.
2. Exterior and working parts oily.
3. Nothing in bore.
4. Sight down.
5. Spare parts in box.
6. Cleaning material and oil in box.
7. Mainspring released.
8. Charging handle forward and safety up.

NOTICE TO ARMORERS IN CHARGE OF LEWIS MACHINE GUNS

The efficient working of the Lewis machine gun largely depends upon the bearing surfaces between the sides of the striker post and the sides of the cam-shaped slot in the bolt being kept perfectly smooth. In most guns, the action of the gun itself continues to keep the surface of this sliding contact properly smooth, provided the parts are kept well oiled. Sometimes, however, in the case of new guns, slight "burring" may occur and prevent the smooth working of the gun. Any such roughness or "burring" caused by wear on either of the sides of the striker post (generally on the right-hand side) or on the bearing edges of the cam-shaped slot in the bolt (generally on the left-hand side) must at once be carefully smoothed as follows:

Use either a very fine oil-stone or very fine emery cloth, or powdered emery with oil, and thus remove any roughness and secure perfectly smooth bearing surfaces between both sides of the striker post and both edges of the cam-shaped slot in the bolt.

Careful attention must, however, always regularly be given to these most important bearing surfaces; but after the sides of the striker post and cam slot edges have once been carefully smoothed this roughness seldom occurs.

If either too coarse materials or too much careless force is used to smooth these surfaces, the angle of sliding contact may become slightly altered and more roughness or "burring" may be caused.

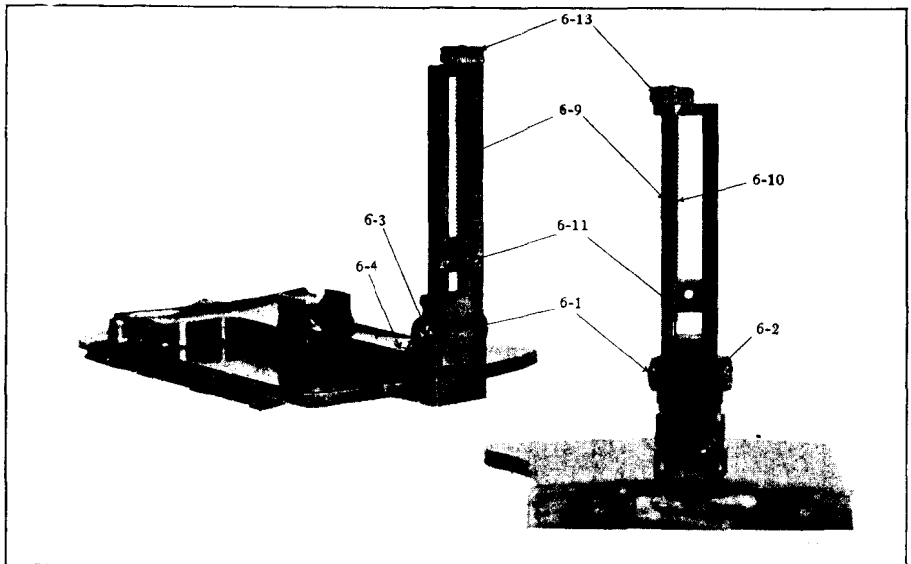

PLATE IX—BACK SIGHT

PLATE IX

BACK SIGHT

6-1 Back Sight Axis Pin
6-2 Back Sight Axis Pin Washer
6-3 Back Sight Axis Pin Split Keeper
6-4 Back Sight Bed Spring
6-9 Back Sight Leaf
6-10 Back Sight Elevating Screw
6-11 Back Sight Slide
6-13 Back Sight Elevating Screw Head

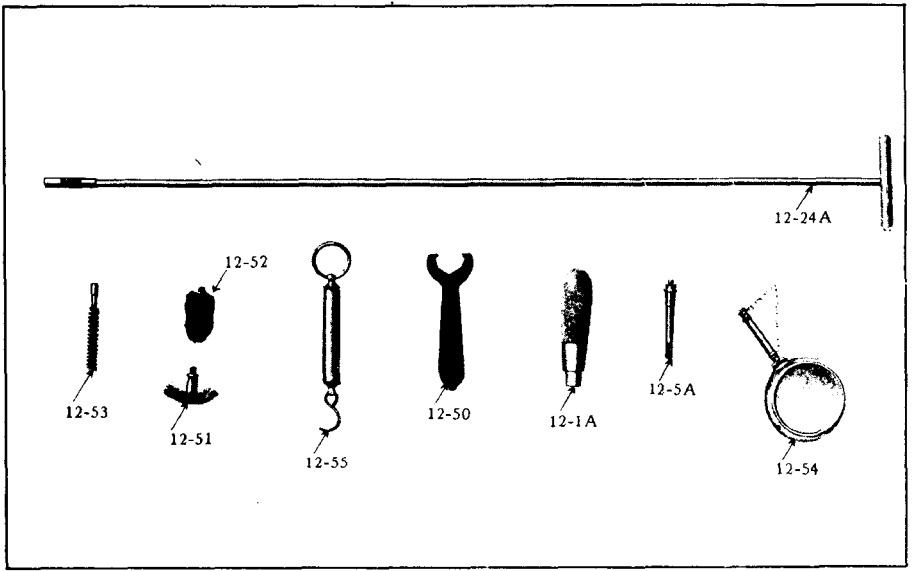

PLATE X—ACCESSORIES

PLATE X

ACCESSORIES

12-5A	Shell Extractor (assembled)
12-1A	Charging Handle Extension (assembled)
12-50	Barrel Mouthpiece Spanner
12-24A	Barrel Cleaning Rod (assembled)
12-51	Cylinder Cleaning Brush (wire)
12-52	Cylinder Cleaning Mop
12-53	Barrel Cleaning Brush (bristle)
12-54	Oil Can
12-55	Spring Balance

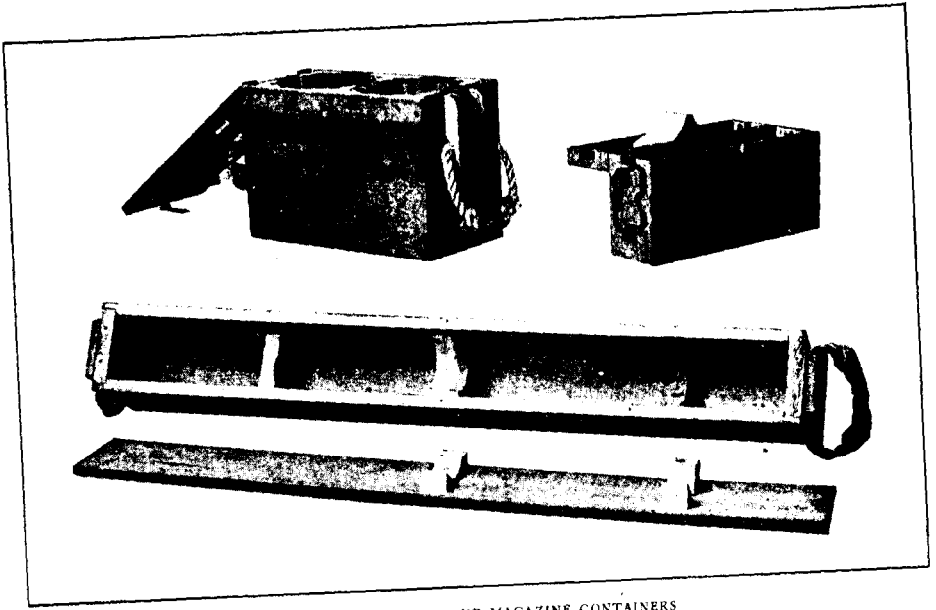

PLATE XI—GUN BOX AND MAGAZINE CONTAINERS

CLEANING *and* OILING

The gun must be cleaned thoroughly as soon as possible after firing. Barrel should be swabbed with oil or a nitro-solvent as soon as gun is unloaded. The gas regulator cup, gas chamber and gland, gas cylinder and piston should also be temporarily cleaned and oiled at once.

To Clean Barrel. Introduce cleaning rod at muzzle, pursuing in other respects the same methods prescribed and using the cleaning solutions issued for cleaning the U. S. magazine rifle, model 1906. Cleaning with nitro-solvent on patches of cloth does not require dismounting the gun. The charging handle may merely be drawn back until the sear engages the rack.

To use the ammonia solution for metal fouling, the barrel must be taken off the receiver, the radiator casings, front and rear, must be removed, and the gas chamber gland must be taken out. The chamber and the gas port must be securely corked with suitable rubber corks and a short length of rubber tubing must be slipped over the muzzle of the barrel so that the ammonia solution will stand in the tube well above the end of the muzzle.

The greatest care must be taken not to bend or injure the guide lips of the chamber at the rear end of the barrel. Cleaning the barrel from the muzzle is directed so as to reduce as far as possible the danger of injuring these projections.

Cleaning the barrel should be repeated every day for several days after the gun has been fired and until the acids driven into the pores of the steel by the pressures of firing have been completely neutralized. The ammonia metal fouling solution neutralizes acid residue at one application.

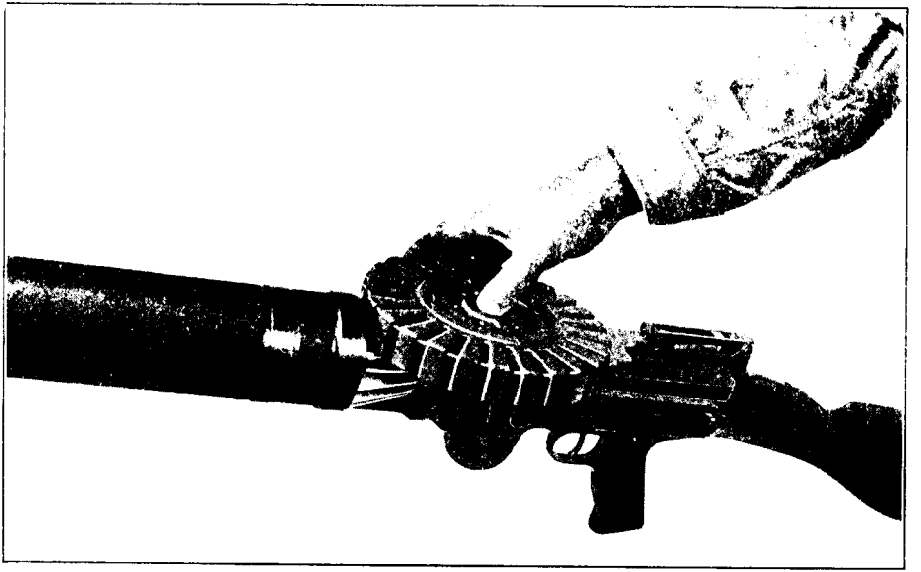

PLATE XII- VIEW SHOWING PROPER METHOD OF PLACING MAGAZINE ON MAGAZINE POST

To Clean Gas Cylinder. For temporary cleaning, cylinder need not be taken out of gun. Withdraw bolt and piston and insert cylinder cleaning rod through piston hole in receiver. Clean first with a wire brush and gasoline and then with the mop and oil.

If gun is left uncleaned after firing, thread may seize and make cylinder hard to unscrew. Thread should then be soaked with oil before trying to unscrew. Push rack well into squared portion of cylinder before unscrewing—if not in far enough, cylinder may be split at rear end.

To Clean Action Parts. Soak off hard fouling with gasoline or oil. Parts cleaned with gasoline should be dried and oiled afterward. Additional oiling of moving parts, the surfaces against which they bear and parts through which gas passes is necessary to prevent friction and clogging as well as rust. The striker post and the inside of the bolt should always be kept well oiled. Whenever any time is available during firing it is advisable to oil them again. The feed operating stud, piston and rack should also be oiled frequently, Magazine latch and outer edge of cartridge spacer ring should be oiled lightly. All screw threads should be kept well oiled to prevent their sticking from rust.

Be liberal in use of oil.

A good grade of high flash oil should be used.

STOPPAGES

POSITION OF CHARGING HANDLE	REMEDY	PROBABLE CAUSE	PREPARATION FOR INSTRUCTION
First Position—Charging Handle *forward*.	1. Try magazine. If it rotates freely to left, change it.	Empty magazine, no round in chamber.	Empty magazine on post.
	2. If magazine is fixed, pull back charging handle and continue firing.	(a) Misfire. (b) Space in magazine. (c) Insufficient rotation of magazine.	Charging handle forward *on range*. Leave space in magazine.
	3. If 2 fails, change magazine.	Damaged magazine.	Dummy. Live round. Dummy.
	4. If stoppage recurs, examine feed pawl and stop and rebound pawls. If feed pawl is broken magazine will not rotate.	Damaged feed pawl or stop or rebound pawl.	
	5. If 3 fails and trigger being pressed gun does not fire, examine mainspring. If light, tighten; if broken, change gear and casing. If mainspring all right, change piston and rack.	(a) Weak or broken mainspring. (b) Broken or damaged striker.	
	6. If charging handle will not come back, use charging handle extension or belt. If stoppage recurs, examine chamber.	Hard extraction. (a) Expansion of empty case. (b) Grit or rust in chamber.	*On Range.* Put damaged dummy in chamber, pull trigger and put full magazine on post.

Second Position—Less than a cartridge length from forward position.	Use charging handle extension or double pull through and pull back handle. Examine round ejected, if—		
	(a) Damaged or too large round, continue firing.	Damaged round.	
	(b) If correct, take off magazine, insert shell extractor into chamber and push home with bolt and withdraw with front portion of separated case.	Separated case in chamber.	File a groove around cartridge case 1 inch from base.
	(c) Separated case is telescoped on to cartridge, continue firing. N. B.—In nine cases out of ten the next cartridge pulls out the separation.	Separated case telescoped on to next cartridge.	Ditto 1 inch from shoulder.
	(d) If separation recurs shortly, change bolt.	Too sharp extractors, which cut cartridge case at base.	
Third Position—More than 3 inches back.	1. Examine ejection opening; if there is no obstruction, pull back charging handle, continue firing. If recurs, take out gas regulator cup, remove magazine and fire one round; replace regulator cup large hole to rear. Clean out gas cylinder, oil	Bolt has not gone back far enough to get behind base of cartridge. (a) Friction in gas cylinder. (b) Hard extraction.	

STOPPAGES—Continued

POSITION OF CHARGING HANDLE	REMEDY	PROBABLE CAUSE	PREPARATION FOR INSTRUCTION
Third Position—Continued.	working parts; if any roughness on striker post or cam slot in bolt, change them.		
	2. If on pulling back handle there is little or no resistance, if main spring is light, tighten; if broken, change.	Weak or broken mainspring.	*On Range.* Weaken mainspring.
	3. If an empty case is in chamber or ejection opening, take off magazine, draw back charging handle, and unload without firing. If empty case is in chamber, force out with cleaning rod from muzzle end. If there are no signs of extractors, or only one extractor gripping it, change bolt; otherwise continue firing.	(a) Bad extractors. (b) Hard extraction. (c) If empty case is in receiver, weak extractors or broken ejector.	*On Range.* Place empty case chamber. Magazine on post and pull trigger
	4. If stoppage recurs, examine extractor, exchange whichever is faulty.		

Third Position—Continued.	5. If charging handle cannot be moved, remove magazine. If charging handle flies forward, change magazine.	(a) Damaged magazine jammed. (b) Magazine not properly on magazine post. (c) Broken magazine catch spring. (d) Broken or damaged magazine spacer ring causing it to jam.	*On Range.* Do not push magazine properly home.
	6. If on removing magazine, charging handle remains in position as before— (a) Help cartridge into correct position on feed way. (b) Test cartridge guide spring. (c) Test mainspring.	(a) Weak or broken cartridge guide spring. (b) Too weak mainspring. (c) Too much gas.	

(1) The tension of the main spring can easily be told by pulling back the charging handle.
If the main spring is broken, the collet pin will be "out."

NOTE—If the gun continues to fire after the trigger is released, push forward trigger with hand on right side.
This will be caused by broken or weak spring, or damaged sear.

SEQUENCE OF IMMEDIATE ACTION

LEWIS MACHINE GUN

No 1 POSITION

(Charging Handle Forward)

Try Magazine

IF FREE TO ROTATE
Change it
Reload, relay and fire

IF FIXED (will not rotate)
Pull charging handle

IF GUN DOES NOT FIRE
Pull C. H. Watch ejection opening

IF GUN FIRES SINGLE SHOTS
Examine gas regulator

IF CHARGING H. WILL NOT GO BACK
Remove magazine

IF CARTRIDGE IS EJECTED
Examine primer

IF NO CARTRIDGE IS EJECTED
Examine feed mechanism
Repair if necessary

IF C. H. THEN COMES EASILY
Put on new magazine
Reload, relay and fire

IF C. H. STICKY
Relay and fire

IF STRUCK
Pull C. H., relay, fire

IF PRIMER NOT STRUCK
Change piston and rack, reload, relay and fire

No. 2 POSITION

(Charging Handle between thumb-piece of safety and forward position)

FORCE BACK CHARGING HANDLE

IF STOPPAGE RECURS

Take out gas regulator, fire a shot. Insert with large hole to rear. Clean and oil

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No. 3 POSITION

(Charging Handle behind thumb-piece of safety.) Examine ejection opening

IF CLEAR
Pull C. H.

IF CASE IN BOLT-WAY
Examine ejector
Replace if necessary

IF CHAMBER OBSTRUCTED
Pull C. H. Raise safety, remove magazine, clean and examine rim of cartridge

IF C. H. DOES NOT COME BACK
Change magazine, reload, relay and fire

IF C. H. COMES BACK
Relay and fire

IF RIM CUT IN TWO PLACES
Reload, relay and fire

IF RIM NOT CUT
Change bolt

IF C. H. DOES NOT GO FORWARD
Change gear casing (complete)

IF C. H. STARTS FORWARD AND STICKS
Pull C. H. Raise safety
Remove magazine
Inspect cartridge guide
Replace if necessary

IMMEDIATE ACTION
in
REPLACING PARTS

TO CHANGE CARTRIDGE GUIDE

Remove magazine.

TO CHANGE MAGAZINE PAWLS (STOP AND REBOUND)

Remove magazine, butt stock and feed cover.

TO CHANGE FEED PAWL

Remove magazine, butt stock and feed cover.

TO CHANGE EXTRACTORS

Remove magazine, butt stock; release gear, removing charging handle and bolt.

TO CHANGE GEAR COMPLETE

Remove magazine, butt stock; release gear; remove charging handle, bolt and operating rod. Force back receiver locking pin; unscrew receiver ⅛ of a turn.

TO CHANGE RECEIVER LOCKING PIN

Same as gear.

TO CHANGE CHARGING HANDLE

Remove magazine, butt stock; drop gear.

TO CHANGE EJECTOR

Remove magazine, butt stock; feed cover; pull charging handle to rear. Put feed operating arm to right. Remove ejector cover and ejector, by inserting point of cartridge underneath.

COMPONENT PARTS AND REFERENCE NUMBERS

1-1 Butt Plate
1-2 Butt Plate Screw
1-3 Butt Stock
1-4 Butt Tang
1-5 Butt Tang Screw
1-6A Butt Stock (assembled)

2-1 Receiver
2-2 Ejector Cover
2-3 Ejector
2-4 Safety
2-6 Receiver Locking Pin

3-1 Barrel
3-2 Barrel Mouthpiece
3-3 Radiator
3-4 Radiator Casing, Front
3-5 Gas Regulator Key
3-6 Gas Chamber
3-7 Gas Chamber Gland
3-8 Gas Regulator Cup
3-13 Clamp Ring
3-14 Front Sight (3 heights)
3-15 Clamp Ring Screw
3-16 Clamp Ring Positioning Screw
3-19 Gas Cylinder
3-20A Radiator Casing, Rear (assembled)

4-1 Feed Operating Stud
4-2 Bolt
4-3 Extractor
4-4A Bolt (assembled)

5-1 Guard
5-2 Butt Latch
5-3 Butt Latch Spring
5-4 Butt Latch Pin
5-5 Guard Side Piece (right)
5-6 Guard Side Piece (left)
5-7 Guard Side Piece Rivet
5-8 Sear
5-9 Sear Spring
5-10 Sear Pin (used also for trigger pin)
5-11 Trigger
5-12A Guard (assembled)

6-1 Back Sight Axis Pin
6-2 Back Sight Axis Pin Washer
6-3 Back Sight Axis Pin Split Keeper
6-4 Back Sight Bed Spring
6-5 Feed Cover
6-6 Stop and Rebound Pawl Spring
6-7 Stop Pawl
6-8 Rebound Pawl
6-9 Back Sight Leaf
6-10 Back Sight Leaf Elevating Screw
6-11 Back Sight Slide
6-12 Back Sight Elevating Screw Head Spring
6-13 Back Sight Elevating Screw Head
6-14 Back Sight Elevating Screw Head Pin
6-24A Cartridge Guide (assembled)

COMPONENT PARTS AND REFERENCE NUMBERS

(CONTINUED)

6-25A Back Sight Leaf (assembled)

7-1 Feed Operating Arm
7-2 Feed Pawl
7-3 Feed Pawl Spring
7-4 Feed Pawl Retaining Pin
7-5A Feed Operating Arm (assembled)

8-1 Rack
8-2 Striker
8-3 Striker Fixing Pin
8-4 Charging Handle
8-5 Piston Connecting Pin
8-6 Piston

9-1 Gear Casing
9-2 Gear Stop
9-3 Gear Stop Spring
9-4 Gear Stop Pin
9-6 Mainspring Collet Pin
9-7 Gear
9-8 Mainspring Casing
9-9 Mainspring
9-10 Mainspring Rivet
9-11 Mainspring Collet

10-1A Magazine (assembled)

11-1A Bipod Mount (assembled)

12-1A Charging Handle Extension
12-5A Shell Extractor
12-23A Magazine Container
12-24A Cleaning Rod
12-27A Spade Grip (assembled)
12-30A Loading Tool(assembled)
12-49 Magazine Loading Handle
12-50 Spanner Wrench (barrel mouthpiece)
12-51 Cylinder Cleaning Brush (wire)
12-52 Cylinder Cleaning Mop
12-53 Barrel Cleaning Brush (bristle)
12-54 Oil Can
12-55 Spring Balance